CLAIMS

1. A process for preparing a hologram, which process comprises:

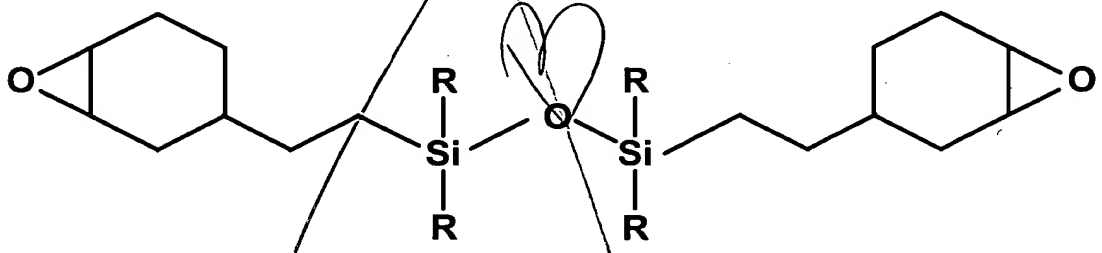
providing a holographic recording medium comprising an acid generator capable of producing an acid upon exposure to actinic radiation; a binder; a difunctional epoxide monomer or oligomer; and a polyfunctional epoxide monomer or oligomer, the difunctional and polyfunctional epoxide monomers or oligomers being capable of undergoing cationic polymerization initiated by the acid produced from the acid generator; and

passing into said medium a reference beam of coherent actinic radiation to which the acid generator is sensitive and an object beam of the same coherent actinic radiation, thereby forming within said medium an interference pattern and thereby forming a hologram within said medium.

2. A process according to claim 1 wherein at least one of the difunctional epoxide monomer or oligomer and the polyfunctional epoxide monomer or oligomer comprises a siloxane

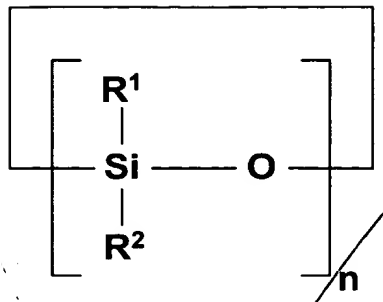
3. A process according to claim 1 wherein at least one of the difunctional epoxide monomer or oligomer and the polyfunctional epoxide monomer or oligomer comprises an cycloalkene oxide.

4. A process according to claim 3 wherein the difunctional epoxide monomer is of the formula:



wherein each R independently is an alkyl or cycloalkyl group.

5. A process according to claim 2 wherein the polyfunctional epoxide monomer is of the formula:



wherein each group R^1 is, independently, a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aralkyl or aryl group; each group R^2 is, independently, R^1 or a monovalent epoxy functional group having 2–10 carbon atoms, with the proviso that at least three of the groups R^2 are epoxy functional; and *n* is from 3–10.

6. A process according to claim 5 wherein the polyfunctional epoxide monomer is 1,3,5,7-*tetrakis*(2-(3,4-epoxycyclohexyl)ethyl)-1,3,5,7-tetramethylcyclotetrasiloxane.

7. A process according to claim 2 wherein the polyfunctional epoxide monomer is of the formula:

$$R^3Si(OSi(R^4)_2R^5)_3$$

R^3 is an $OSi(R^4)_2R^5$ grouping, or a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, or aryl group; each group R^4 is, independently, a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aralkyl or aryl group; and each group R^5 is, independently, a monovalent epoxy functional group having 2–10 carbon atoms.

8. A process according to claim 7 wherein R^3 is a methyl group or an $OSi(R^4)_2R^5$ grouping; each group R^4 is a methyl group, and each group R^5 is a 2-(3,4-epoxycyclohexyl)ethyl grouping.

9. A process according to claim 2 wherein the polyfunctional epoxide monomer is of the formula:

$$(R^6)_3SiO[SiR^7R^8O]_p[Si(R^7)_2O]_qSi(R^6)_3$$

each group R^6 is, independently, a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aralkyl or aryl group; each group R^7 is, independently, a monovalent

substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aralkyl or aryl group; each group R^8 is, independently, a monovalent epoxy functional group having 2–10 carbon atoms, and p and q are integers.

10. A process according to claim 9 wherein each group R^6 and R^7 is an alkyl group.

11. A process according to claim 10 wherein each group R^8 is an 2-(3,4-epoxycyclohexyl)ethyl grouping and p and q are approximately equal.

12. A process according to claim 1 wherein the holographic medium comprises from about 0.2 to about 5 parts by weight of the difunctional epoxide monomer or oligomer per part by weight of the polyfunctional epoxide monomer or oligomer.

13. A process according to claim 1 wherein the holographic medium comprises from about 0.16 to about 5 parts by weight of the binder per total part by weight of the difunctional epoxide monomer or oligomer and the polyfunctional epoxide monomer or oligomer.

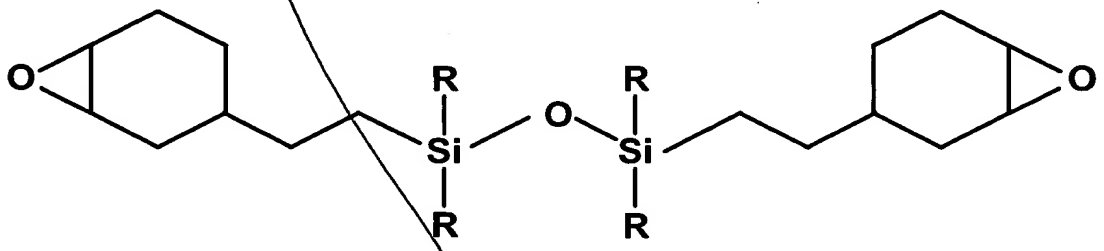
14. A process according to claim 1 wherein the volume shrinkage of the holographic medium during the formation of the hologram does not exceed about 1 per cent.

15. A holographic recording medium comprising an acid generator capable of producing an acid upon exposure to actinic radiation; a binder; a difunctional epoxide monomer or oligomer; and a polyfunctional epoxide monomer or oligomer, the difunctional and polyfunctional epoxide monomers or oligomers being capable of undergoing cationic polymerization initiated by the acid produced from the acid generator.

16. A holographic recording medium according to claim 15 wherein at least one of the difunctional epoxide monomer or oligomer and the polyfunctional epoxide monomer or oligomer comprises a siloxane

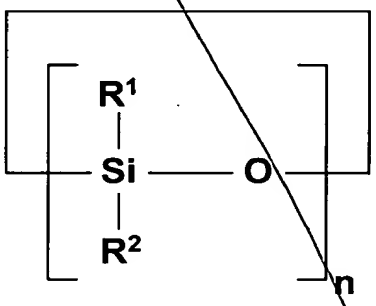
17. A holographic recording medium according to claim 15 wherein at least one of the difunctional epoxide monomer or oligomer and the polyfunctional epoxide monomer or oligomer comprises a cycloalkene oxide.

18. A holographic recording medium according to claim 17 wherein the difunctional epoxide monomer is of the formula:



wherein each R independently is an alkyl or cycloalkyl group.

19. A holographic recording medium according to claim 16 wherein the polyfunctional epoxide monomer is of the formula:



wherein each group R^1 is, independently, a monovalent substituted or unsubstituted $C_{1\text{-}12}$ alkyl, $C_{1\text{-}12}$ cycloalkyl, aralkyl or aryl group; each group R^2 is, independently, R^1 or a monovalent epoxy functional group having 2–10 carbon atoms, with the proviso that at least three of the groups R^2 are epoxy functional; and *n* is from 3–10.

20. A holographic recording medium according to claim 19 wherein the polyfunctional epoxide monomer is 1,3,5,7-*tetrakis*(2-(3,4-epoxycyclohexyl)ethyl)-1,3,5,7-tetramethylcyclotetrasiloxane.

21. A holographic recording medium according to claim 16 wherein the polyfunctional epoxide monomer is of the formula:

$$R^3Si(OSi(R^4)_2R^5)_3$$

R^3 is an $OSi(R^4)_2R^5$ grouping, or a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aralkyl or aryl group; each group R^4 is, independently, a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aralkyl or aryl group; and each group R^5 is, independently, a monovalent epoxy functional group having 2–10 carbon atoms.

22. A holographic recording medium according to claim 21 wherein R^3 is a methyl group or an $OSi(R^4)_2R^5$ grouping; each group R^4 is a methyl group, and each group R^5 is a 2-(3,4-epoxycyclohexyl)ethyl grouping.

23. A holographic recording medium according to claim 16 wherein the polyfunctional epoxide monomer is of the formula:

$$(R^6)_3SiO[SiR^7R^8O]_p[Si(R^7)_2O]_qSi(R^6)_3$$

each group R^6 is, independently, a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aralkyl or aryl group; each group R^7 is, independently, a monovalent substituted or unsubstituted C_{1-12} alkyl, C_{1-12} cycloalkyl, aralkyl or aryl group; each group R^8 is, independently, a monovalent epoxy functional group having 2–10 carbon atoms, and p and q are integers.

24. A holographic recording medium according to claim 23 wherein each group R^6 and R^7 is an alkyl group.

25. A holographic recording medium according to claim 24 wherein each group R^8 is an 2-(3,4-epoxycyclohexyl)ethyl grouping and p and q are approximately equal.

26. A holographic recording medium according to claim 15 comprising from about 0.2 to about 5 parts by weight of the difunctional epoxide monomer or oligomer per part by weight of the polyfunctional epoxide monomer or oligomer.

27. A holographic recording medium according to claim 15 comprising from about 0.16 to about 5 parts by weight of the binder per total part by weight of the difunctional epoxide monomer or oligomer and the polyfunctional epoxide monomer or oligomer.